Part Three: Economic Development Zone Design Guidelines

Sustainable Site Design

Building Design and Energy Use

Indoor Environmental Quality

Materials and Resources

Construction Management

Maintenance of Green Space

Priority Goals

The decisions made at the first phase of building design and construction can significantly affect the costs and efficiencies of later phases. Viewed over a 30-year period, initial building costs account for approximately just 2% of the total, while operations and maintenance costs equal 6%. Recent studies have shown that green-building measures taken during construction can result in significant building operational savings, as well as increases in employee productivity. Therefore, building-related costs are best revealed and understood when they are analyzed over the life-span of a building. Green buildings are cheaper to heat, cool, and light. Because they consume less energy, they produce correspondingly less pollution. In addition, they are healthier spaces in which to work.

The idea that people will be more productive in pleasing surroundings has an intuitive logic that has been demonstrated scientifically. Studies have shown that making a building environmentally responsive can increase worker productivity by 10% to 15% or more. Saving $1 per square foot of energy costs can have a significant effect on a building's financial performance, but that savings is small compared to the benefit of keeping workers –employed at an average annual cost of $130 per square foot - happy and productive. Many work-related illnesses, headaches, and eyestrain are directly related to poor lighting, inadequate fresh air, harsh acoustics, and the gloomy surroundings that prevail in many office spaces. Together, all these enhancements serve to increase worker morale, improve the quality of work performed, and raise productivity.

Set Overall Goals

Site Environmental Impact

There is a great natural beauty to the Milwaukee County Grounds that can be preserved and thoughtfully integrated into the development of new buildings and infastructure. The Master Plan identifies areas for building restoration, conservation, ecological landscape restoration, and sustainable stormwater management that will serve as an overall amenity to the development and to the people who live and work there.

Creation of Public Space

Whether through orientation of buildings to the street and good streetscape, or through the careful preservation and forming of useful space within the conservation areas, a primary goal should be to create a livable development with strong identity.

Energy Efficiency

The highest sustainable priority for a project will often be to significantly reduce the consumption of energy to operate the building. This is based on the fact that it is one of the most tangible life cycle cost saving measures for the owner, and also because the operational and embodied energy (energy to manufacture and transport building materials) consumption of buildings accounts for approximately half of the energy utilized in the United States. The production and consumption of energy has numerous serious long-term environmental impacts: air pollution, global warming, depletion of finite fuel resources, acid rain, and non-point source water pollution to name just a few. It is for these two reasons that most sustainable development experts place the greatest emphasis on energy efficiency. Green features may add about 2% to up-front costs, but can pay for themselves tenfold over the life of the facility.

Indoor Environmental Quality

Enhance the health and productivity of all employees by exceeding current standards for Indoor Air Quality (IAQ), daylight access, lighting quality, views to the outdoors, and acoustical comfort.

Building Material and Equipment Specifications

The design and construction team should study the options for specifying materials which have reduced environmental impacts over their entire life cycle or during the most environmentally significant parts of their life cycle. This goal is based on the significant environmental impacts associated with the resource extraction, manufacturing, installation, and ultimate disposal of building products in our economy. Specifying green building products will help to reduce these impacts and it will also help to support the progressive companies who produce these products, which will ultimately move the economy towards true sustainability.

Stormwater Management

For stormwater quantity and quality management, maximize the use of natural and innovative systems for stormwater conveyance, storage, and treatment.

Water Efficiency and Quality

Reduce potable water consumption and enhance the quality of stormwater on the site. Although water is, technically, a "renewable resource" because it is bound up in the global hydrologic cycle, the way in which we consume, process, contact water consistently degrades water quality. It is for this reason that the design team should look for ways to conserve water and improve the quality of stormwater runoff.

SUSTAINABLE SITE DESIGN

Goal: Redevelop the site in a sustainable manner. Reinforce the existing landscape, create an identity, and sense of place.

The process of site design for sustainable developments begins with identifying, weighing, and balancing the attributes of a site and responding to challenges with thoughtful resource management. Carry out a careful site evaluation early in the process, and use that information to set goals and make efficient decisions. Mitigate existing site problems and create solutions that make sense fiscally for the business, environmentally for occupants, and aesthetically for the greater public realm.

SITE ANALYSIS

Identify existing site, regulatory, and context issues using a Site Inventory Checklist. Refer to Diagram 1: Site Characteristics on page 13.

- Complete a thorough site inventory and analysis. Begin with a Site Inventory Checklist to track existing issues for the site. This will cover transportation and infrastructure, access and connections, site environmental and geotechnical issues, stormwater and other topography issues, ecological issues, and other related information useful to making informed design decisions and identifying constraints.

Benefits

Identifying issues is the first step to analyzing the financial viability of a site and is critical in responsive and efficient design of a new facility or renovation of existing. Proper assessment of site resources can eliminate unnecessary infrastructure and facility expenditures.

GENERAL SITE PLANNING AND DESIGN

Mitigate existing site problems and respond to issues and opportunities identified through the site analysis.

- Provide contextual responses to adjacent developments and/or neighborhoods, and identify shared use opportunities.
- Provide for connections to public amenities (sidewalks, walking paths, bike trails, etc.).
- Minimizes negative environmental impacts and maximize opportunities to restore natural systems (e.g. use of native vegetation to stabilize soils).
- Design landscape and exterior elements to reduce heat island effect.
- Provide shade (within 10 years) on at least 30% of non-roof impervious surface on the site, including parking lots, walkways, etc.
- Reduce impervious surfaces throughout the site.
- Design considering solar position/orientation.

Costs and Savings

Reducing the heat island effect also reduces operating energy costs, through diminished cooling loads resulting from microclimate changes and natural shading.

Fig. SSD-1: Porous pavement and bioswale with trees utilized for drainage and cooling of a parking lot in an office park in Germany with a similar climate to that of Wisconsin.

Fig. SSD-2: Overland bioswales reinforce prairie conservation and enhance vistas, Tellabs, Bolingbrook, Illinois.

STREETS

Provide an interconnected, efficient and attractive street system.

STREET CONNECTIVITY

BASIC LEVEL TECHNICAL STRATEGIES:

- Provide multiple routes for cars and pedestrians, rather than dead-end streets off a primary artery. This is to relieve traffic congestion on the major artery and promote pedestrian use of the site.
- Provide direct routes to destinations, such as shopping, recreation or restaurants.
- Connecting street intersections on streets in the Milwaukee County Grounds EDZ (local streets, collector streets, and major driveways) generally should be spaced between 300 and 600 feet apart in the more intensely developed areas with pedestrian activity.

STREET TYPES

BASIC LEVEL TECHNICAL STRATEGIES:

- Utilize the local and collector street profiles included here.

Regional Collector Street - The main street through the site should have broader travel lanes, buffering of sidewalk from the street, opportunities for bike path, may include a landscaped median, and shall have a right of way ranging from 80' to 100'.

Community Street - Access streets will have narrower travel lanes, on street parking on one or both sides, and shall have a right of way ranging from 60 to 70'.

ADVANCED TECHNICAL STRATEGIES:

In addition to the above:

- Include transitions that signify change from one land-use area to another, such as a grass strip from a less dense district to pavement in a dense commercial district.

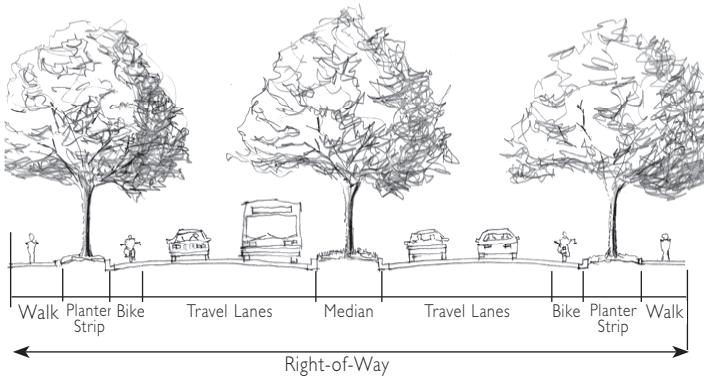

Fig. SSD-3: Main Collector Street - Boulevard

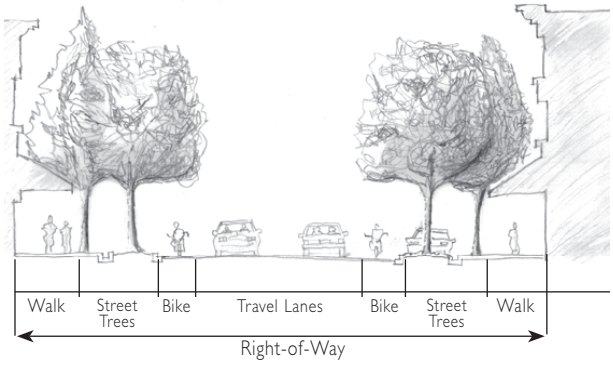

Fig. SSD-4: Community Street

ON-STREET PARKING

BASIC LEVEL TECHNICAL STRATEGIES:

- Provide on-street parking as a buffer between pedestrians and moving vehicles.
- Minimize on-street parking lane to reduce curb-to-curb street width.
- Minimize on-street parking on Collector Street for traffic.

Note: Angle parking is not permitted on City of Wauwatosa streets.

ADVANCED TECHNICAL STRATEGIES

In addition to the above:

- Provide extended sidewalks or curbs at crossings to increase visibility.

URBAN OPEN SPACE AND STREETSCAPE

Provide inviting, safe, and usable open space including street treatment and public access throughout the site.

BASIC LEVEL TECHNICAL STRATEGIES:

- Provide open space amenities for building occupants.
- Screen views to parking and service from street.
- Enhance streetscape through street amenities (architectural fencing, benches, plantings, etc.) and directional signage.

ADVANCED TECHNICAL STRATEGIES:

In addition to the above:

- Restore 50% of site open space with native vegetation.
- Create contiguous areas of green space.

Benefits

According to a recent Knoll/Hay Group study, workplace design and workplace amenities were significant factors in employee satisfaction and productivity, and can impact employee recruitment and retention.

Well-designed open space creates a sustainable microclimate that can in turn reduce building energy use.

Fig. SSD-5: Open space along a sidewalk.

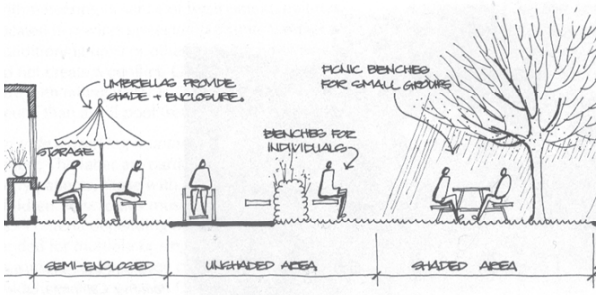

Fig. SSD-6: A variety of seating options for private employee open space enables greater use.

STREET TREES

Provide street trees to enhance the attractiveness, comfort, and safety of the street design.

BASIC LEVEL TECHNICAL STRATEGIES:

- Provide continuous, uniformly, and closely spaced tree plantings along the length of streets.
- Space larger trees between 20 to 30 feet apart; 35 feet is the maximum spacing.
- For trees planted in tree wells with tree grates, provide a planter area of 5 feet by 5 feet.
- Plant trees within center medians.
- Street trees do not need to be one species, but can alternate to provide variety.
- Provide a proper soil mixture, aeration, and hydrology to sustain the root zone of all street trees.

Note: Variances from City of Wauwatosa Zoning Ordinance shall be reviewed on a case-by-case basis. City of Wauwatosa only maintains street trees within the right-of-way.

ADVANCED TECHNICAL STRATEGIES:

In addition to the above:

- Permit tree planters within on-street parking lanes.

Benefits

Given a limited budget, street trees are often considered the most effective expenditure of funds to improve a street. For many people, trees are the most important single characteristic of a good street.

Fig. SSD-7: Street trees provide many important functions along streets, including reducing the impacts of the volume and speed of traffic on pedestrians adjacent to travel lanes.

Transportation, Parking, and Service

Encourage public and alternative transportation. Provide efficient vehicular access and parking.

Fig. SSD-8: Walking and bike paths/trails encourage the use of alternative transportation methods.

Basic Level Technical Strategies:

- Design shall encourage public and alternative transportation, such as buses, bicycles, and carpools, through the use of special facilities or preferred parking.
- Parking lots are at zoning minimum, shared and/or structured.
- Parking areas are pedestrian-oriented.
- Parking areas include stormwater bioretention.

Incentives to pervious and structured parking are detailed in Appendix C.

Advanced Technical Strategies:

In addition to the above:

- Share parking and/or driveways with adjacent development.
- Parking areas use porous pavements.

Costs and Savings
Reduced paving costs.

Benefits
Less paving will reduce heat and glare off the pavement expanses and increase the visual attractiveness of the parking lot.

Fig. SSD-9: Bioswales within parking lots can collect stormwater and break up large areas of impervious pavement, Tellabs Corporate Headquarters, Naperville, Illinois.

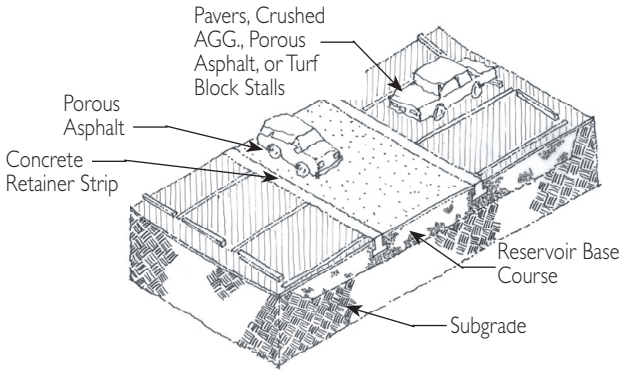

Fig. SSD-10: Reducing parking lot imperviousness

Examples of porous pavement options in Wisconsin.
These porous paving surfaces have been or are currently being tested in Wisconsin or Northern Illinois.

(a.) Pervious concrete
(b.) Porous asphalt
(c.) Unit pavers (brick, concrete, or stone)
(d.) Crushed aggregate
(e.) Cobbles

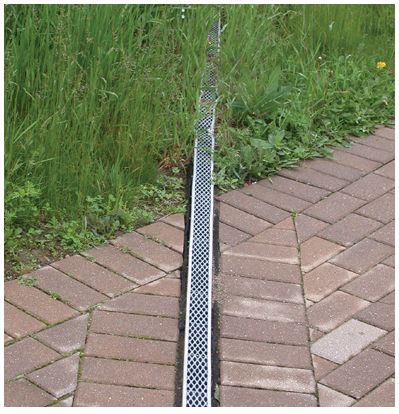

Fig. SSD-11: A level spreader that interfaces with a pedestrian walk, Coffee Creek Center, Chesterton, Indiana.

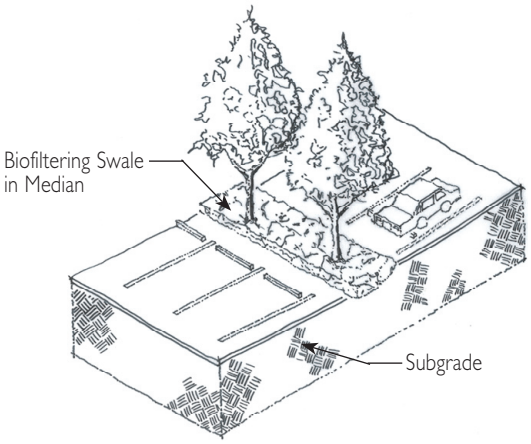

Fig. SSD-12: Vegetated swales locally manage stormwater runoff from parking areas

SUSTAINABLE LANDSCAPE PRACTICES

Incorporate native vegetation and sustainable planting practices. Promote conservation and restoration of ecological and water resources. Install aesthetic, durable landscaping that contributes to the larger unified sense of place. A Planting and Material List is included in Appendix B.

BASIC LEVEL TECHNICAL STRATEGIES:

- Remove invasive species. Native plants and cultivars have grown to tolerate regional climate fluctuations and local pests, resulting in species that do not need chemicals or watering to survive.
- Analyze soils for species suitability.
- Canopy and mid-size trees: use 100% native or cultivars of native species.
- Distinguish between 10' perimeter building envelope and open space for plant species and hardscape materials.
- Landscape for water efficiency, limiting the need for potable water irrigation.
- Landscape for water quality enhancement such as planting watershed buffers, bioswales, and surface stormwater drainage as design elements.
- Include a minimum 5-year establishment/maintenance plan in the original landscape budget.
- Many portions of the site, especially large, contiguous areas, are suitable for native landscape establishment. While native landscapes are less costly to maintain, it is critical to reestablish stewardship and management techniques that recreate their historic habitat. This includes controlled annual burning, other forms of weed control, and selective clearing of woody plant material.
- Minimize the use of turfgrass lawn as a default landscape typology; rather, use turfgrass in certain areas to edge and accent planting areas, and for more active uses. All other landscape elements should be naturalized or restored native landscapes.

Note: All non-street-tree items within the public right-of-way will not be maintained by the City of Wauwatosa.

Fig. SSD-13: Prairie landscape instead of lawn, University Research Park, Madison, Wisconsin.

Fig. SSD-14: Water features included in landscape recirculate and cleanse stormwater, Tellabs Corporate Headquarters, Naperville, Illinois.

Costs and Savings

- Reduced costs of landscape installation and maintenance.
- Reduced cost of stormwater management infrastructure.
- A recent study of larger properties estimates that over a 20-year period, the cumulative cost of maintaining prairie totals $3,000 per acre versus $20,000 per acre for non-native turf grasses. (Ref: Study conducted by Applied Ecological Services).

Benefits

- Creation of distinctive and attractive properties.
- Reduced soil erosion.
- Improved water quality.
- Native plants attract and provide food and shelter for wildlife.

WATER QUALITY MANAGEMENT

Meet or exceed the requirements of NR151 of the Wisconsin Administrative Code for reducing stormwater discharge pollutants (removal of 80% of average annual post development total suspended solids (TSS), and 40% of the average annual post development total phosphorous (TP).

BASIC LEVEL TECHNICAL STRATEGIES:

- Reduce Directly Connected Impervious Areas *(DCIAs)* to less than 20% of total impervious area.
- Control erosion by stabilizing soils with native vegetation.
- Utilize "natural" BMPs for water quality management.
- Utilize a concerted system of Stormwater Treatment Train *(STT)* concepts, such as bio-swales, rain gardens, roof restrictors, and sub-surface sand filter strips.

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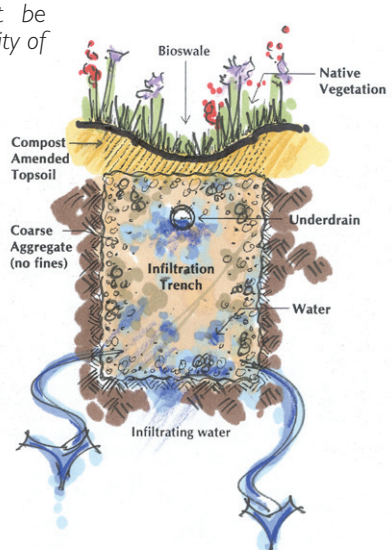

Fig. SSD-15: Typical bioswale diagram.

ADVANCED TECHNICAL STRATEGIES:
In addition to the above:
- Remove an additional 10% of TSS.
- Utilize naturalized drainage features as desired herein for water quality management.
- No DCIAs.

NOTE:
It is the developer's responsibility to determine soil quality. Predominate soils in Wauwatosa are clays. Site soil testing will be necessary to determine conditions and infiltration strategies for both Water Quality Management and Stormwater Quantity Management. Many native species will increase the friability of the soil, i.e. break down heavy clays.

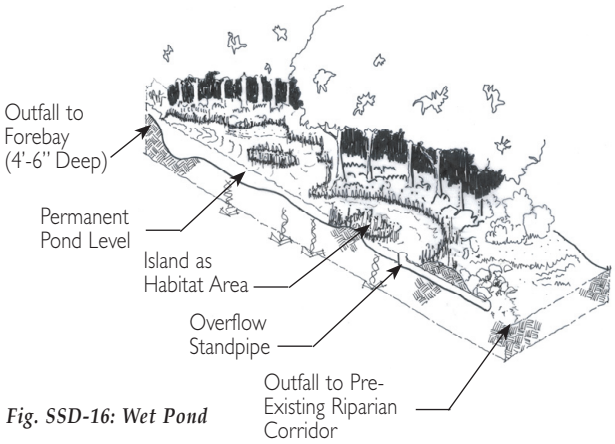

Fig. SSD-16: Wet Pond

STORMWATER QUANTITY MANAGEMENT

Per Chapter 13 of the Milwaukee Metropolitan Sewerage District (MMSD) rules, manage stormwater discharges by limiting the volume and peak flow rates so that no net increases from undeveloped to developed conditions is created. Utilize on-site retention and infiltration to the maximum extent practical. See page A-9 in the Appendix for information on Green/Vegetated Roofs and their impact on stormwater management.

Benefits
Urban runoff systems that appear like natural systems are very effective at commanding increases in property values.

Natural STTs are more economical, best represent natural hydrology, and provide better aesthetics for development. Development costs can be reduced over conventional development costs by 2-5%, while marketing and market premiums may be increased 10-50% based on real example projects.

Costs and Savings
By disconnecting downspouts from storm sewers you can save money by using less water on landscaping and reduce the load on the local storm sewer system during periods of heavy rain.

BASIC LEVEL TECHNICAL STRATEGIES:
- Develop a Stormwater Management Plan.
- Consult Wisconsin Department of Natural Resources *(WDNR)* NR 216 , WDNR NR 151 Runoff Management, and MMSD Chapter 13 stormwater permit requirements. Infiltrate stormwater in accordance with WDNR NR 151 and COMM 82 of the Wisconsin Administrative Code.
- Maximize the use of natural and innovative systems for stormwater conveyance and storage.

  Note: At the time of this publication the City of Wauwatosa Stormwater Ordinance is under revision and updates are pending. The permitting process is being revised.

ADVANCED TECHNICAL STRATEGIES:
In addition to the above:
- Design site with solely natural drainage systems (no hook-up to storm sewers).
- Share stormwater treatment with multiple neighboring sites.

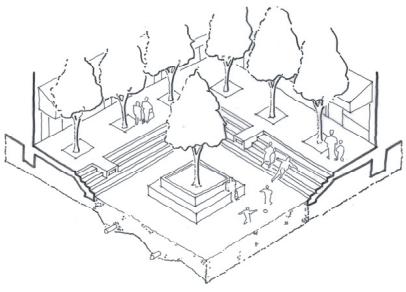

Fig. SSD-17: Dry Pond - dry weather use

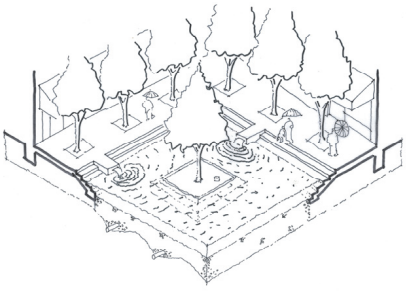

Fig. SSD-18: Dry Pond - wet weather use

STORMWATER QUANTITY MANAGEMENT (CONTINUED)

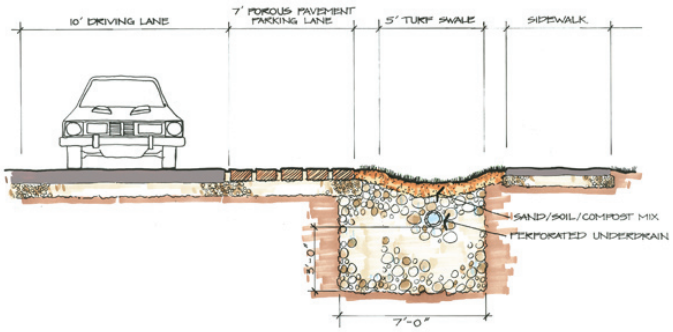

Fig. SSD-19: Stormwater Management - Parking, Gravel Infiltration Trench.

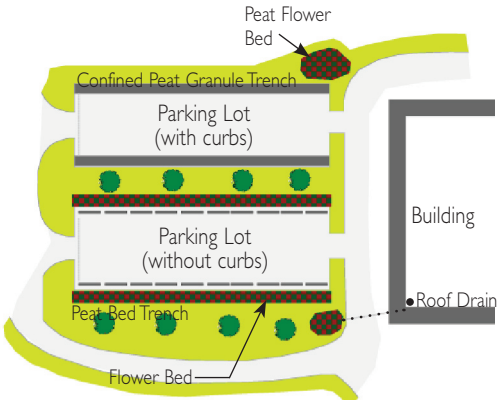

Fig. SSD-20: Bioswales within parking lots can collect stormwater and break up large areas of impervious pavement.

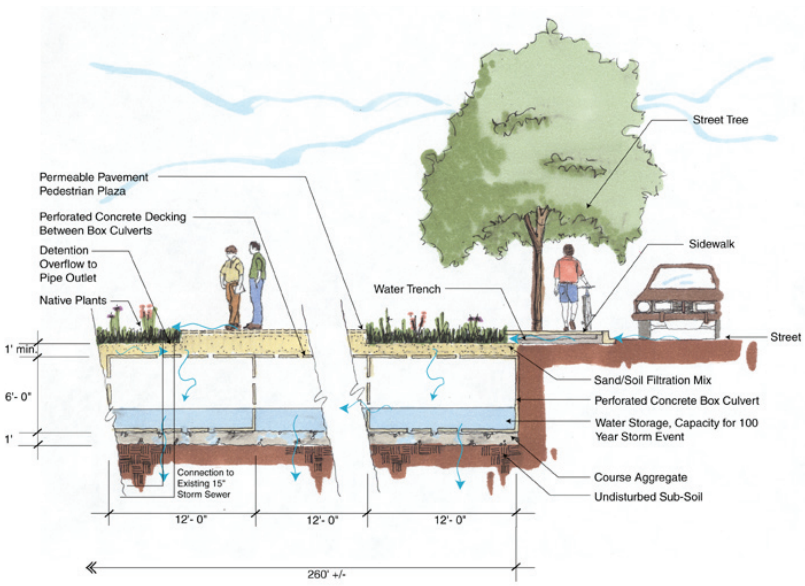

Fig. SSD-21: A proposed underground cistern at St. Ambrose University, Davenport, Iowa.

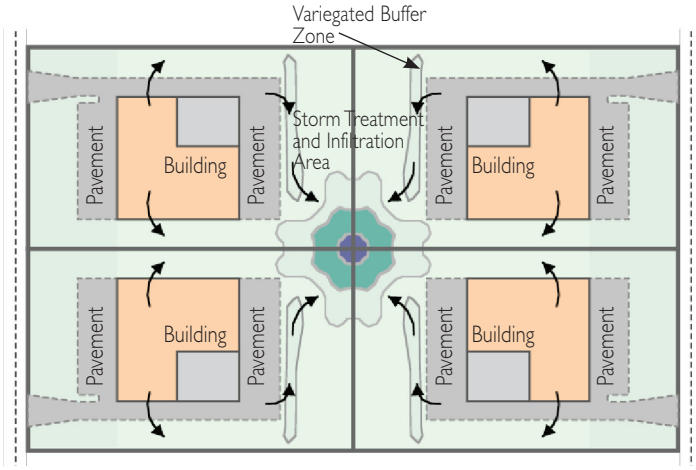

Fig. SSD-22: Shared Stormwater Management.

Site Lighting and Light Pollution Reduction

Create a safe and friendly nighttime environment, but minimize light pollution from site lighting in accordance to the Illuminating Engineering Society of North America Recommended Practice Manual: Lighting for Exterior Environments.

Costs and Savings
Commercial establishments consume 20% to 30% of total energy for lighting. Efficient exterior lighting, as a component, translates to energy cost savings.

Fig. SSD-23: This teardrop twin pendant fixture has a cutoff luminaire to reduce lighting pollution. Provide a standard street/pedestrian light for the EDZ.

Basic Level Technical Strategies:

- Use only energy efficient lamp technologies wherever possible such as metal halide, induction lamps, high-pressure sodium, and linear and compact fluorescent sources. Avoid using fluorescent sources that are not suited for low temperature operation. Avoid using mercury vapor lighting systems. Incandescent sources should be avoided unless integrated with a control mechanism.
- Use IESNA recommended light level ranges. Use the lower recommended values in order to reduce energy usage, yet stay within recommendations. Abnormally bright lights can create glare and deep shadows, which make seeing extremely difficult. Illumination ratios between areas should be minimal (e.g., less than 10:1)
- Parking and Driveways: use light colored reflective edges along drives or walks and high-efficiency cutoff lighting fixtures that emit no light above the horizontal or into the sky. Use cutoff lighting fixtures for all lamps more than 2800 lumens.
- Open space: prioritize areas that must be lit for safety.
- Building Illumination: See *Architectural Features*, pages 40-41.

Advanced Technical Strategies:

In addition to the above:

- Building exterior and interior lighting leaves zero direct-beam illumination at site line.
- Turn off all unnecessary lighting after hours.
- Utilize motion detection/activation systems wherever possible. This doubles as a security feature and increases energy efficiency.

Signage and Wayfinding

Provide pedestrian and driver-oriented signage and wayfinding cues for the development and greater NE Quadrant region.

Benefits
Wayfinding systems welcome visitors, increases business visibility, and promote repeat visitors.

Fig. SSD-24: Street Wayfinding Sign

Basic Level Technical Strategies:

- Design a signage plan for wayfinding which meets City of Wauwatosa requirements.
- Provide clear signage for orientation and safe access to the development.
- Provide clear signage for orientation and safe access to points of interest (trails, Forestry Education Center) or other routes (freeway, downtown) from the development.
- Provide educational signage or historical markers at significant natural or cultural locations (Eschweiler buildings, County Parks building, and County Grounds history).
- Wayfinding signage shall be uniform in design, materials, and coloration.
- No intrusions shall be permitted directly in the pedestrian right-of-way.
- For building signage see *Architectural Features*, page 38.

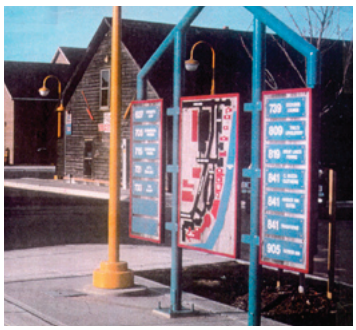

Fig. SSD-25: Pedestrian Scale Signage

BUILDING DESIGN AND ENERGY USE

Goal: High quality buildings that minimize energy consumption and aesthetically respond to the context established by the historic buildings on site without detracting from their prominence.

Sustainable building practices offer an opportunity to create environmentally-sound and resource-efficient buildings by using an integrated approach to design promoting resource conservation and cost savings through energy efficiency, renewable energy, and water conservation features; considering environmental impacts and waste minimization; creating a healthy and comfortable environment; reducing operation and maintenance costs; and addressing issues such as historic preservation.

BUILDING PLACEMENT AND ORIENTATION

Locate and orient building forms and volumes in response to context (i.e. historic buildings and topography), to create public space, and to take advantage of solar opportunities and prevailing winds. Orienting the front entrance of buildings to the street is fundamental in increasing regional and local access as well as mobility from transit, walking, and bicycling. Logical orientation facilitates pedestrian access and supports pedestrian activity on the street.

BASIC LEVEL TECHNICAL STRATEGIES:

- Align building and site elements to form a visually continuous street edge. Provide horizontal spatial definition to streets with buildings oriented to the street.
- Provide vertical spatial definition to streets with buildings oriented to the street. Ratios less than 5:1 of building height to right-of-way provide a visually defined street environment; ratios of 1:2 to 1:3 are ideal.
- Integrate stormwater management concepts at building placement.
- Orient occupied areas and entrance to street(s) and/or other public space.
- Orient buildings along east-west axis for maximum controlled daylighting and solar gain.
- Screen service areas and other areas generating noise, dust, or odors. Locate rooftop equipment toward the rear of the building and screen.
- Street trees can be used to reduce the perceived scale of the street width. With tall buildings located on a narrow right-of-way, building setbacks along a recess line can preserve daylight access to the street and provide street spatial definition.

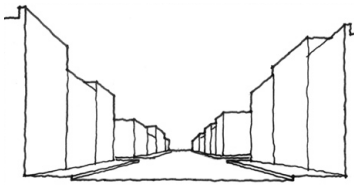

Fig. BDE-1: Continuous setback line maintained by all the buildings on the street.

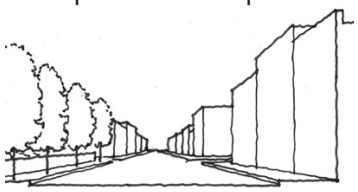

Fig. BDE-2: Continuous setback line maintained by trees along street edge.

Costs and Savings

Proper building location and site density economizes the amount of site to be purchased, excavated, constructed, and maintained.

Proper building orientation, with other passive solar strategies, can significantly reduce the size and cost of the mechanical systems.

Fig. BDE-3: Orienting the front entrance of buildings to the street facilitates pedestrian access and increases visibility.

BUILDING FORM AND SCALE

Create a building footprint and massing which has visual interest and relates to neighboring structures. Maximize the efficiency of mechanical systems while utilizing natural daylighting strategies.

BASIC LEVEL TECHNICAL STRATEGIES:

- Mass buildings and articulate facades in relationship to existing neighbor structures and with sensitivity to pedestrians by having a more refined scale along street edges and hiding blank walls.

Costs and Savings

Building form, along with orientation, is a primary factor in daylighting and other solar strategies.

Diminished heating and cooling loads reduce operating costs.

- Balance a "thick" vs. "thin" plan to provide views and daylighting, creating a building footprint which does not significantly increase energy costs, exterior enclosure costs, and foundation pile costs.

FOOTPRINT ARTICULATION

Buildings shall be configured in an interesting, yet efficient manner to maximize daylighting, create occupant efficiency, and result in a pleasing aesthetic.

- Runs of flat, blank walls exceeding 45' shall not be permitted. Wall interruptions (such as bays, corners, bump-outs, etc.) shall be located based on the architectural precedents of the building.

ROOFS (DEFINED ROOF EDGE / ROOFLINE ARTICULATION):

Benefits
Varying roof forms create an interesting and diverse development which will set the EDZ apart from other developments that tend to look monotonous.

- New construction shall utilize one of the following roofing forms:
  - *Flat (concealed with a flat or stepped parapet)*
  - *Gabled (cross, end-gabled or side gabled)*
  - *Hip*
  - *Shed*
- Additions to the existing historic buildings shall utilize the predominate building form on the main structure. Based on the existing building stock, this would either be a hip or gabled roof, see Appendix A.
- Grouping of buildings are encouraged to use complementary roof forms.

SCALE

Benefits
Good pedestrian scale results in a people friendly sidewalk where time wants to be spent. Where people spend time, they often spend more money.

A streetscape that is inviting to the community is a result of scale. Multi-storied buildings in long rows feel monotonous to the public. Elements that break up a building into smaller parts make for a more inviting streetscape. Features that add distinction and result in a pedestrian friendly streetscape include:

- *Awnings*
- *Benches*
- *Canopies*
- *Doors*
- *Dormers*
- *Landscaping (planter boxes, trees, etc.)*
- *Signage (signboard, projecting, decal on glass)*
- *Street Lighting (lower and inviting)*
- *Windows (at street level)*

WINDOW ARTICULATION

Benefits
A strategy as simple as more windows (balanced with efficient envelope design) means facilities are less reliant on artificial lighting, which keeps indoor air cooler and savings on air conditioning.

Windows take a large role in comprising the building form. The layout and size of windows create rhythmic patterns on the building surface resulting in a "solid" and "void" affect. This visual affect breaks down the mass of the building into a smaller scale. Window articulation sets the proportions of a building. Historically, window opening sizes were divided in half as the building height grew. The effect emphasizes the base portion of the building where retail is typically located.

- *Parcels A, B, and C*: Storefront windows shall comprise the majority of first level windows. The proportion of glass to solid wall mass shall reduce as the building raises in height. Buildings comprising only office uses are not required to use storefront windows. Windows shall be sized and aligned based on the architectural precedents of the building.
- *Parcel D*: Windows shall be sized and aligned based on the architectural precedents of the building.
- *Parcel E*: New construction shall express the window articulation evident on the adjacent historic buildings.

- New construction shall have window glass comprise no less than 25% and no more than 40% of its wall surface.

Building Height

Allowable building height staged in zones allows for maximizing square footage along busy thoroughfares while preserving vistas and controlling noise pollution in the conservation and recreation areas.

Basic Level Technical Strategies:

- Vistas in front of historic buildings shall be preserved.
- Exposed basement's shall not constitute a story of building height.
- Occupiable space may be incorporated within sloping roof structures, permitting that it is code compliant.
- Adjacent buildings shall differ in height no more than one story.

Additional building height opportunities are detailed in *Appendix C: Opportunities and Incentives for Sustainable Development.*

Benefits

Building with concentrated footprints, rising several stories result in more compact development and subsequently more efficient land use.

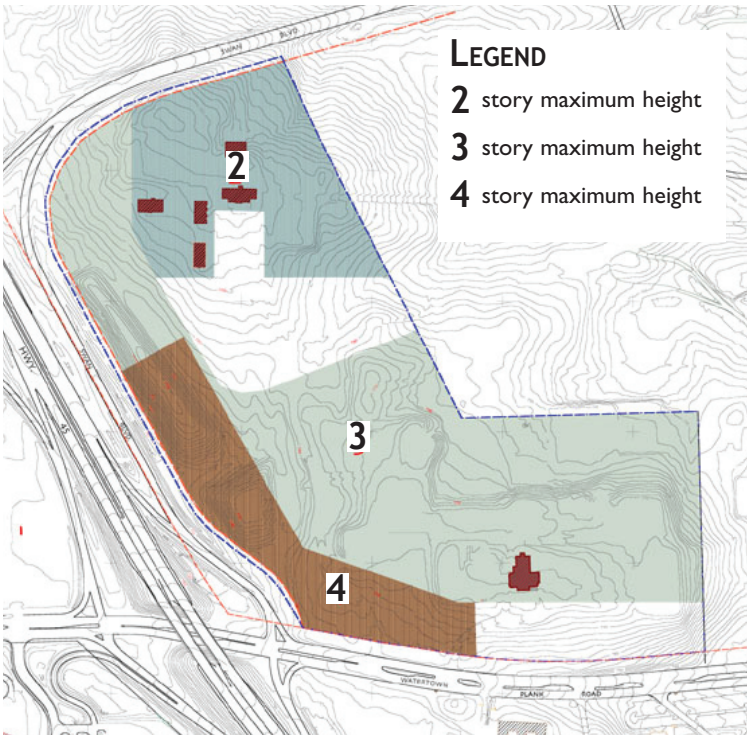

Fig. BDE-4: Building Height Zones. Buildings located within these zones shall not exceed the number of floors shown within the demarcated areas.

Interior Layout

Organize interior volumes for energy efficiency and occupant health.

Basic Level Technical Strategies:

- Group spaces with similar uses or requirements for optimum control of mechanical systems, indoor environmental quality issues (air, visual, noise, odor, control zoning), and functional adjacencies.
- Use non-program spaces as thermal, olfactory, or acoustical buffer zones.
- Configure occupied spaces for natural systems of daylighting and ventilation.
- Design stairs to be pleasant and inviting.

Benefits

Layout efficiency and indoor environmental quality promote operational efficiency and reduce absenteeism.

BUILDING ENVELOPE AND ARCHITECTURAL FEATURES

Detail building envelope for energy efficiency and maintenance cost savings as well as aesthetic appeal. Exceed State of Wisconsin Thermal Envelope Calculation Requirements or ComCheck EZ baseline calculations by 20%.

Costs and Savings
Outfitting a building with energy-efficient equipment makes sense from any perspective, it saves money, reduces urban air pollution, helps protect natural habitats, and improves the indoor environment.

BASIC LEVEL TECHNICAL STRATEGIES:

- Select envelope materials that meet context and energy efficiency standards.
- Design enclosure to minimize thermal loss/gain and controls moisture. Insulate minimum R-20 for walls, R-30 for roof, and R-11 for foundation.
- Provide entrance features which clearly identify them for wayfinding.
- Specify doors and windows that meet or equal Energy Star® certification.
- Provide integrated architectural surface treatments and decorative elements.

All architectural features shall be selected based on the precedents of the architectural style of the building. The following features are encouraged but will vary in implementation based on the building style, type, and use.

AWNINGS

- Awnings made of cloth or soft vinyl are strongly encouraged for use over first floor storefronts.
- Awning color shall compliment the building.
- Text may be printed on the front edge of an awning as signage. Scalloped or fringed front edges are encouraged.
- Hard plastic awnings over a fixed metal frame shall not be permitted.

BALCONIES

- Balconies shall not be added to existing historic buildings.
- Balconies located on street facing facades may be best recessed behind the exterior wall line.

BAYS

- Bays (style appropriate) are encouraged to articulate building elevations.
- Bays (style appropriate) for use include:
  - *One-story bays*
  - *Two-story bays*
  - *Cutaway bays*
  - *Oriel - a bay canted out from the wall of an upper story.*
  - *Square or box bays*

CANOPIES

- Canopies shall be constructed out of permanent materials and include details that are consistent with the predominate building details. These details may include (but are not limited to) features such as:
  - *Brackets*
  - *Cornices*
  - *Dentils*
  - *Scrollwork*
  - *Tensions rods*

Color

- Color preferences are very personal and should be given careful consideration. Building owners are encouraged to select colors based on the architectural style of the building and the architectural precedents/context of the EDZ's historic buildings.
- Major architectural elements suggested as opportunities for color transitions:
  - *Awnings*
  - *Building Base*
  - *Canopies*
  - *Columns/Pilasters*
  - *Doors and Door Frames*
  - *Gutters and Downspouts*
  - *Main Wall Surface*
  - *Railings*
  - *Roof Covering*
  - *Window Frames, Sashes, and Trim*
- Color transitions shall follow logical repeating patterns.
- Monotonous color schemes, lacking in contrast are discouraged.
- Neon colors shall be prohibited from use on all buildings and building features.
- Primary colors shall be prohibited from use on building walls.

Decks

- Decks shall be located only in rear or side yards. Portions of a deck visible from the street shall be screened with the appropriate landscaping or fencing.

Door and Door Openings

Door, openings, and surrounds create balance on the facade. These elements have a significant visual and functional impact on the building.

- Door styles shall be placed based on the architectural precedents of the building.
- Main entries shall be visible from the street or face the street.
- Main entry doors and frames shall be prominently articulated features on the facade.

Dormers

Dormers are excellent features to add building character, break up a roofline, and admit natural light.

- Dormers shall all be real with windows.
- Dormers shall be sized, located, and grouped based on the precedents of the architectural style.
- 6" minimum dormer rake or eave overhang.

Glazing (Glass)

- Permitted Glass Types (style appropriate):
  - *Art Glass*
  - *Clear*
  - *Glass Block*
  - *Patterned and Textured Glass*
  - *Ribbed or Fluted Glass*
- Highly reflective or dark tinted glazing shall not be permitted.
- Glass shall be free and clear of color with the exception of decorative art and leaded glass.

Exceptions shall be determined on a case-by-case basis by the Design Review Board.

Loading Areas

- Loading docks, shipping, and receiving areas shall be located on the rear or side yards of buildings whenever possible.
- Loading areas shall be further obscured from view with the addition of walls, fencing, or landscaping.
- Loading areas that have no alternative but to be located in an area visible from the public-right-of-way shall be treated as a decorative architectural feature of the building. These areas shall then be constructed out of materials consistent with those used on the facade and further supplemented with the use of landscaping. Loading dock doors shall remain closed when not actively in use.

Mechanical and Rooftop Equipment

Mechanical equipment on roofs shall not be visible from the street. Locate mechanical equipment on the ground in rear or side yards of the building whenever possible. In situations where this equipment would be visible from the street, an enclosure shall be erected. This enclosure shall be made of materials in-keeping with those present on the building; options also include fencing and hedges for ground-mounted equipment.

The following items shall not be visible from the street:

Air Compressors / HVAC Equipment
Pool Pumps
Dumpsters
Utility Boxes or Meters

- Solar panels or photovoltaics may be visible from the street as this will highlight the sustainable principles of this development. However, these features should be located with respect to their aesthetic impact. Photovoltaics may be incorporated as canopy elements, awnings over doors and windows, and on roofs.
- Roof protrusions other than chimney and plumbing vent stacks shall not be viewable from the street. Vent stacks shall be painted or finished to blend in with the overall roofing color.
- Satellite dishes shall not be visible from the street.

Fig. BDE-5: Roof mounted photovoltaics, Schlitz Audubon Nature Center, Bayside, Wisconsin.

Benefits

Photovoltaics still work effectively covered with up to 3" of snow (ref: Chicago Center for Green Technologies).

Porches, Colonnades, Railing, and Stoops

- The size, location, style, and detailing of porches varies dramatically based on the architectural style and use of the building. Many buildings in the EDZ may choose not to utilize these design features. The porch is the most prominent portion of the building to address the street and provides important pedestrian scale to the streetscape. The manner in which the porch is articulated has a significant impact on the perception of the building as a whole.
- Balusters and railings shall be a minimum of 1-1/2" square or diameter with a minimum of 4" clear space between the porch decking or the stoop. Railing shall be a minimum of 42" in height. Required railing shall conform to applicable codes.
- Massing and details shall be consistent with the architectural styling of the building.
- Porches and colonnades shall consist of a roof supported by columns.
- Porches shall be at least 12" above grade and 6'-0" in depth from the exterior wall surface of the building.
- Stoops shall be covered by a projecting roof form that can be mounted to the face of the building and supported by brackets.

Columns
- Two-story columns shall not be permitted unless divided by a full-width second level porch with railing.
- Columns shall be a minimum of 6" x 6" or the equivalent diameter.
- Piers shall project a minimum of 3" from the wall surface of the building.

Materials
- Balustrades shall be executed in wood or wood composite.
- Materials shall be selected that are consistent with the architectural styling of the building.

Roof Secondary Elements

Downspouts
- Downspouts shall be constructed out of pre-finished or galvanized metal.

Gutters
- Gutters shall be made of pre-finished or galvanized metal.

Scuppers
- Scuppers add a level of detail to the roofing system. These features are most appropriate on ornate and traditional styles of architecture. Scuppers may be pre-finished or galvanized metal.

Snow Guards
- Snow guards shall be required on slate, standing seam metal, metal shingle, and other steeply pitched roofing forms and materials.

Stormwater Cisterns
- Locations for stormwater cisterns should be selected based on the overall drainage plan for the building and site, balanced with the aesthetics of the exterior.
- Locations may dictate that cisterns be highlighted and non-obscured. In this instance, design should incorporate pleasing materials that will accent the overall building aesthetic.
- Cisterns may be screened with architectural details or landscaped features/ materials.

Note: Copper shall not be used as it leaches harmful chemicals into the soil.

Fig. BDE-6: Cistern as a featured object, Chicago Center for Green Technologies, Chicago, Illinois.

Sidewalk Cafes

Outdoor opportunities to enjoy a beverage or dinner, contribute to the livelihood of the streetscape. This activity creates an energy that entices pedestrians into commercial establishments and benefits the business community as a whole. Sidewalk cafes are permissible upon approval by the Plan Commission. Factors to be considered are:
- Availability of sufficient pedestrian right-of-way.
- Configuration and specific components of the cafe.
- Municipal ordinances.
- Space available for cafe seating on the sidewalk or a designated patio area.

Fig. BDE-7: Sidewalk cafe's result in outdoor environments where people want to spend time.

Fig. BDE-8: Monument Sign.

Fig. BDE-9: Projecting Sign.

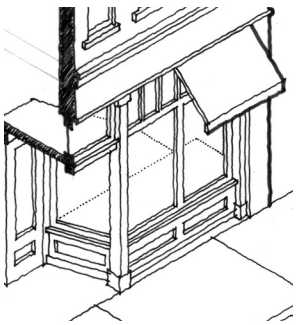

Fig. BDE-10: Appropriate storefront features add pleasing pedestrian scale to a building.

SIGNAGE

Many types of traditional signage are appropriate for use in the EDZ including the following:

Awning
Backlit (non-box type)
Hanging signs mounted on brackets
Leaded or art glass transom letters
Monument
Neon
Paint or vinyl on glass
Projecting
Raised or painted letters
Sandblasted or etched structural glass signage
Wall mounted cast bronze plaques or tablets

- All signage styles shall be selected based on the architectural precedents of the building and the context of the overall development.
- Backlit signs are acceptable for use in the form of individual letters with metal frames. No plastic box signs are permitted.
- Brackets, anchors, chains, and other attachment methods shall be considered as part of the design proposal for the building.
- External illumination shall be concealed from view.
- No flashing, scrolling, or moving signs shall be permitted.
- Signs shall be electrically lit from within unless it can be proven accurate to the style of the building.
- Wall mounted, ground exterior, or roofline lighting is an acceptable means to accent signage or architectural details.

Sign Content

- Business signs shall only include the name of the business, nature of business, and the address. Advertising of brand names is not permitted. Professional office buildings may list the tenants of the building on small-scale signs, preferably wall mounted.

Projecting Signs

Projecting signs shall meet the following criteria:

- Projecting signs shall not be located above the main floor level of the building or above the second floor line.
- Hanging signs shall project no more than 40" total from the face of the building.
- Signs or brackets shall be mounted to structural piers or pilasters on the building.

Window Signage

There are many precedents for painted or vinyl letters applied to glass. This signage shall be executed in light colors. Dark colors will be less visible from the street. The size of the sign shall not account for more than 25% of the glass size in which it is located.

STOREFRONTS

New buildings are encouraged to utilize the following design characteristics on commercial storefronts:

- *Awning or Canopy*
- *Lower Window Panel: area between the ground level and the display windows.*
- *Pilasters (as appropriate to the architectural style of the building)*
- *Recessed Entry Doors*
- *Display Windows: large glass areas to show-off merchandise.*
- *Transom Windows: Located above doors and display windows, often operable.*
- *Signboard: area above the transom and below the second floor windows.*

Streetscape Features

Provide pedestrian kiosks, benches, newspaper racks, trash cans, bus shelters, cafe tables, hanging flower baskets, and chairs to increase the number of opportunities for people to socialize and spend leisure time outdoors along public streets.

Bike Paths

- Bike paths may be surfaced in a variety of materials based on location. Bike paths shall in all cases be clearly signed. In commercial or heavy pedestrian areas bike paths may be incorporated into the sidewalk as illustrated in Figure BDE-11 or as a bike lane next to travel lanes. In all cases bike paths shall not intrude within the pedestrian or motor vehicle right-of-way.

Bike Racks

- The addition of bike racks is encouraged. Racks shall be positioned out of the pedestrian right-of-way, easily accessible to streets or bike paths.

Lighting

- Provide pedestrian scaled lighting to provide a separation from street traffic and a more inviting human-scaled experience.
- Provide lighting over marked crosswalks.
- Provide continuity of lighting fixture style, location, and spacing.

Planters

- Planters may be used as accent planting areas along the face of a building. Planters must not be over 36" in width or cover a predominate section of the sidewalk.
- Window planters are acceptable.
- Planters may be constructed out of stone, concrete, composite materials, wood, or metal.

Public Seating Areas

- Public seating areas shall be positioned out of the pedestrian right-of-way.
- Public seating areas shall be styled consistently with the style of other public amenities.
- Seating areas shall take the form of solitary benches, grouping of benches, or tables with chairs. Acceptable materials include concrete, composite materials, metal, stone, or wood. Plastic seating shall not be permitted.

Fig. BDE-11: Bike path lane clearly defined within the sidewalk area while allowing for a properly sized pedestrian right-of-way.

Fig. BDE-12: Bike racks allow for alternative transportation.

Skylights

- Bubble or dome skylights shall not be permitted.
- Skylights shall be installed parallel to the roof and in locations where they are not viewable from the public right-of-way.

Towers

Towers add significant stature to a building. This feature shall be located sympathetic to the architectural style of the building.

- Towers shall be limited to one per building. This feature shall be taller than the main body of the building; however its roof does not have to be taller than the main roof form.
- Materials to finish the tower shall be the same as those used on the surrounding building surfaces.

Trash Enclosures

- Enclosures concealing trash receptacles shall be sized based on the type and height of receptacle. Large dumpsters and small portable cans vary in size. Enclosures around these units shall be designed and sized to conceal the total height of the unit from view.
- Enclosure material shall compliment the building in color and material.
- Trash collection areas shall be located in rear and side yard areas.

Window, Window Opening, and Fenestration

Proportions

- Muntin patterns or grids shall be utilized only according to the architectural precedent of the building.
- Window casings shall be a minimum of 3-1/2" wide on primary facades where used.

General

- Mixing of window types should be carefully selected. Haphazard sizing and placement will result in an unsightly appearance. However some variation in window size and style can enhance the building aesthetic.
- Double height window openings shall not be permitted. However, structural glazing is a clear exception to this.
- Specialty window types such as fanlight, octagon, Palladian, and oval shall be limited to one per elevation unless flanking pairs are a precedent of the architectural style.

Daylighting and Lighting

Incorporate cool daylighting to a achieve a Daylight Factor of 2% in 75% of occupied space. Supplement with high performance lighting to achieve a Lighting Power Density (LPD) of between 0.8 and 1.0 watts / sf.

Costs and Savings

Payback for an efficient lighting system strategy is immediate, because the capital costs saved by downsizing the cooling system typically exceed the extra costs of providing better lighting.

Diminished heating and cooling loads reduce operating costs.

Basic Level Technical Strategies:

- Balance glazing strategy - specify high performance low-emissivity glazing with visible transmissivity less than 0.4.
- Design high ceiling heights for maximum daylight penetration (depth 1.5 - 2 times window head height).
- Incorporate monitors and clerestories.
- Incorporate photocell-dimming sensors and occupant controls.
- Include light shelves and exterior shading devices to control daylight.
- Incorporate other site and building elements, such as trees, arcades, deep window insets, or light wells to enhance and control daylighting.
- Lighting systems in office areas shall be split task-ambient with light sensitive, dimming electronic ballasts, and high efficiency T-5 or T-8 lamps.

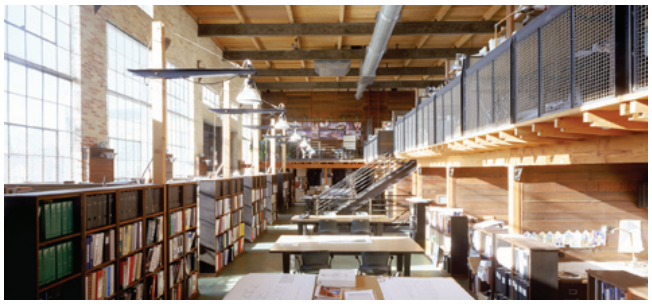

Fig. BDE-13: Natural daylighting reduces the amount of artificial lighting required during daylight hours, The Kubala Washatko Architects, Inc., Cedarburg, Wisconsin.

Lighting (Exterior)

Lighting shall be sized and placed to ensure horizontal and vertical cutoffs are appropriate as to deter lighting pollution. Light spread and glare onto adjacent properties shall be kept to an appropriate minimum.

- Canopy and accent lighting located on the street-facing or primary facade(s) shall at minimum consist of fixtures located above entrance locations. Accent lighting shall be permitted to highlight architectural features, forms, and landscaping. These fixtures shall be reasonably lamped to prevent glare and light spread that may interfere with residential uses, street lighting, and lighting on adjacent properties.
- Floodlighting is limited to a 150-watt maximum. Floodlights shall not be directed toward side yards or the street.
- Lighting sources shall be linear and compact fluorescent, high-pressure sodium, induction lamps, or metal halide.
- Lighting fixtures shall be located at logical locations such as flanking doors, above doors, obscured by landscaping features, overhanging roofline, etc.

Benefits

Separate studies on the impact of the indoor environment, analyzed 73 stores for a retailer and found higher sales in the locations with significant amounts of daylighting - a profit worth at least 19 times more than the energy savings. In addition, workers in a Sacramento utility's call center who had an excellent view through a window worked up to 12% faster than those with no view. (Ref: Nancy Clinton, P.E, IALD, LC, Clanton and Associates, Inc., Energy Effective Lighting: Lighting As If People Matter, November 20, 2003).

Building Energy Use

Exceed the minimum State of Wisconsin Energy Code performance requirements for a reduced energy cost goal of 20% (new) 110% (existing) from baseline modeling per ASHRAE/IESNA Standard 90.1-1999 Section 11.

Basic Level Technical Strategies:

- Include fundamental commissioning of building systems.
- Design an integrated 'whole-building' approach to systems. First with building siting, then optimize building shell, then capture solar gain, and finally meet the remaining needs with high-efficiency mechanical and lighting equipment.
- Use CFC-free HVAC&R equipment.
- Electrical equipment meets Energy Star® certification standards.
- Allow for future renewable energy infrastructure.

Advanced Technical Strategies:

In addition to the above:

- Reduce design energy cost by 35% (new) /25% (existing).
- Include additional commissioning by a third-party agency.
- Energy load management system included in design.
- Use renewable energy resources to contribute 5% of power usage. Incorporate innovative systems in unused space such as installing photovoltaics on the roof or incorporating them into canopy design.

Costs and Savings

Studies have shown that commissioned buildings will consistently exceed industry standard levels of energy efficiency by 5% to 15%.

Higher first costs for installation of controls can be offset by operating savings achieved through efficiency. Reducing hours of operation saves equipment life and eliminates unnecessary cycling.

Costs and Savings

Calculating average days of sunlight on an annual basis, Milwaukee receives 96 days per year as compared with Daytona, Florida's 97 days per year (ref: Data calculated from reports received from the National Weather Service, National Oceanic and Atmospheric Administration division).

Fig. BDE-14: An alternate wall framing system 26% more energy efficient than that required by Wisconsin Enrolled Building Code resulted in lower heating and cooling costs with minimal upfront construction cost increases, Schlitz Audubon Nature Center, Bayside, Wisconsin.

WATER EFFICIENCY

Employ strategies that in aggregate use 10% less potable water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements.

Costs and Savings
Saving water saves money on water and sewer bills.

BASIC LEVEL TECHNICAL STRATEGIES:

- Reduce potable water usage through the use of efficient landscaping and the use of high efficiency plumbing fixtures, such as low flow electronic sensor faucets on lavatories.

ADVANCED TECHNICAL STRATEGIES:

In addition to the above:

- Employ whole building design strategies that in aggregate use 20% less water than baseline.
- Use captured rain for 50% of landscape irrigation needs over conventional means which use potable water.

Fig. BDE-15: Rain garden, Coffee Creek Center, Chesterton, Indiana.

OPERATIONS AND MAINTENANCE

Incorporate best practices for good operating and maintenance procedures.

Costs and Savings
Operational savings are achieved through efficient management of systems and extended life of equipment and materials, reduced damage and repairs to equipment and systems, and energy savings that accrue based on efficient running of systems.

Benefits
Negative impacts on the environment are reduced or eliminated by using low-toxicity or non-toxic cleaning products.

BASIC LEVEL TECHNICAL STRATEGIES:

- Prepare Operations and Maintenance Manual / Plan per ASHRAE 4-1993.
- Schedule custodial operations regularly.
- Utilize 'Green Seal' - approved or equal products.
- Prepare a waste prevention and recycling plan.

ADVANCED TECHNICAL STRATEGIES:

In addition to the above:

- Form an in-house "green team" to raise awareness of environmental concerns.

INDOOR ENVIRONMENTAL QUALITY

Goal: Provide a healthy and productive environment for occupants. Increase the comfort and alertness of occupants thereby improving occupant productivity and reducing absenteeism.

Positive indoor environmental quality encompasses such factors as temperature and relative humidity, type of materials and finishes, adequate ventilation, visual comfort, noise control, and the degree of controllability occupants have over these factors.

INDOOR AIR QUALITY

Air quality and comfort throughout the building should meet or exceed ASHRAE Standard 62-1999 (Ventilation) and Standard 55-1992 (Thermal Environment).

BASIC LEVEL TECHNICAL STRATEGIES:

- Prohibit smoking in the building.
- Minimize toxic emissions from materials and finishes by using low-VOC adhesives, paints and coatings, carpet, composite wood, and furniture.
- Provide direct exhaust for all spaces that generate moisture and pollutants, including toilet and locker rooms, copy rooms, and rooms where cleaning chemicals are stored.
- Locate fresh air intakes away from sources of air contamination such as loading docks, exhaust fans, and cooling towers.
- Provide walk-off mats at entry areas to control dirt and dust.

ADVANCED TECHNICAL STRATEGIES:

In addition to the above:

- Increase ventilation to exceed air change effectiveness 0.9 per ASHRAE 129-1997.
- Provide contaminant monitoring and control systems.
- Allow two-week flush out of mechanical systems and building interior at 100% outside air before occupancy.

Benefits

Improved indoor air quality increases occupant comfort, alertness, and sense of well-being, reducing absenteeism and lowering health care costs linked to upper respiratory discomfort and illness.

Herman Miller recorded an increase in productivity from 98.4% to 99.53% and quality from 98.97% to 99.23% in its new facility that provided high air quality and daylight. [1]USGBC Case Study, Miller SQA Building (www.usbbc.org/resource/miller.htm).

VISUAL QUALITY

Combine natural light with split task-ambient high performance lighting systems for enhanced visual quality in accordance with the American Standard Practice of the Illuminating Engineering Society of North America ASNI/IESNA #RP-1-1995. See "Building Energy Use" for additional details on Daylighting and interior lighting.

BASIC LEVEL TECHNICAL STRATEGIES:

- Maximize daylighting. Provide a design that yields a minimum daylight factor of 1.5% on the work plane at a depth of 15 ft. from the building exterior for all applicable perimeter spaces.
- Design interior layout to provide visual access to exterior views.
- Specify visible light transmission for glazing at 50% or higher for most spaces.
- Comply with IESNA Standards in consultation with client-specified lighting levels.

Benefits

Daylight and high quality illumination, in tandem with increased visual contact with the outdoors, contributes to occupant's sense of well being, reducing fatigue levels and increasing productivity.

Tests show an increase in 1% to 25% on office worker performance based on lighting conditions. Productivity and performance clearly improved with electronic ballasts over magnetic ballasts (ref: Veitch and Newsham, 1998).

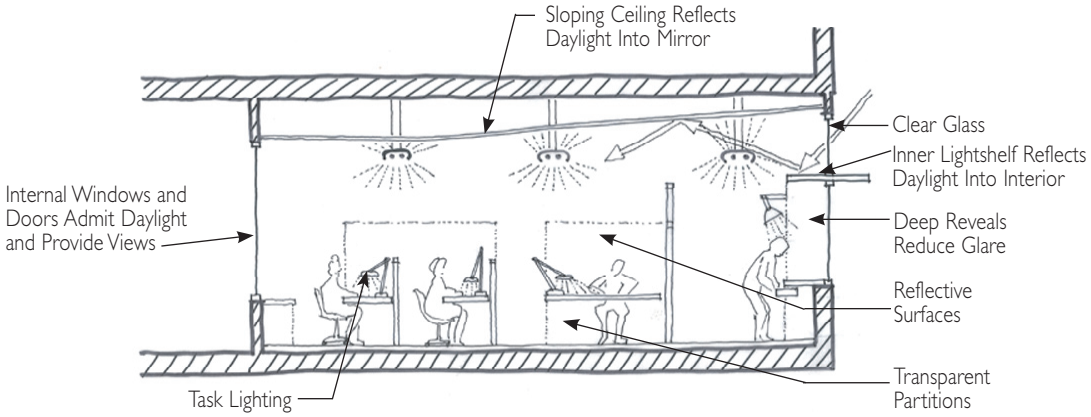

Fig. IEQ-1: Elements of Good Visual Quality.

ACOUSTIC QUALITY

Internal: Maximum noise criteria (NC) of 35 in occupied areas.
External: Maximum decibel reading of 50db at property line.

Benefits
Studies have shown that when office workers are satisfied with their environmental conditions, when they can work in greater comfort and control, they will be more productive. (Ref: Slater, Bordass and Heasman, "People and Lighting Controls", BRE Information Paper 6/96, and Baker, "The Irritable Occupant: Recent Developments in Thermal Comfort Theory", Architectural Research Quarterly, Winter 1996)

BASIC LEVEL TECHNICAL STRATEGIES:

- In areas of high ambient noise (traffic, etc.) windows to be rated at an STC of 40 or better. In other areas, windows to achieve a minimum STC of 35.
- Use site elements such as landscaping, walls, or other features to reduce noise.

CONTROLLABILITY

Allow for occupant control of building environment.

BASIC LEVEL TECHNICAL STRATEGIES:

- Provide strategically placed operable windows.
- Provide controls for lighting, airflow, and temperature.
- Provide adjustable window coverings at potential problem areas to control light and undesired heat gain based on time-of-day.

ADVANCED TECHNICAL STRATEGIES:

- Provide individual workstation environmental controls where applicable.

MATERIALS AND RESOURCES

Goal: Emphasize the use of materials and furnishings that are non-toxic, low-VOC, sustainable, contain high post consumer recycled content, and are recyclable.

Conventional selection criteria for building materials are strength, durability, cost, appearance, and suitability. To these, the sustainable building adds environmental impact and toxicity. In many cases, the production and disposal of building materials has far worse consequences than the material's actual use. Sustainable buildings endeavor to reuse or use resources efficiently, and give preference to materials which have low environmental impact.

RESOURCE EFFICIENCY

Develop a material and resource conservation plan through design, efficient construction, reuse of materials, and implementation of a recycling program.

BASIC LEVEL TECHNICAL STRATEGIES:

- Maximize material resources (e.g. building multi-story on foundation piles).
- Dimension building in a modular fashion to reduce waste.
- Specify salvaged or refurbished materials for 5% of total building materials.
- Institute and maintain an aggressive facility recycling program.

ADVANCED TECHNICAL STRATEGIES:

In addition to the above:

- Specify salvaged or refurbished materials for 10% of total building materials.

Costs and Savings

Direct cost savings in reduced materials and finishes usage.

Waste removal and dumpster fees can be reduced.

Refurbished office panel systems can be 50-75% of the cost of new.

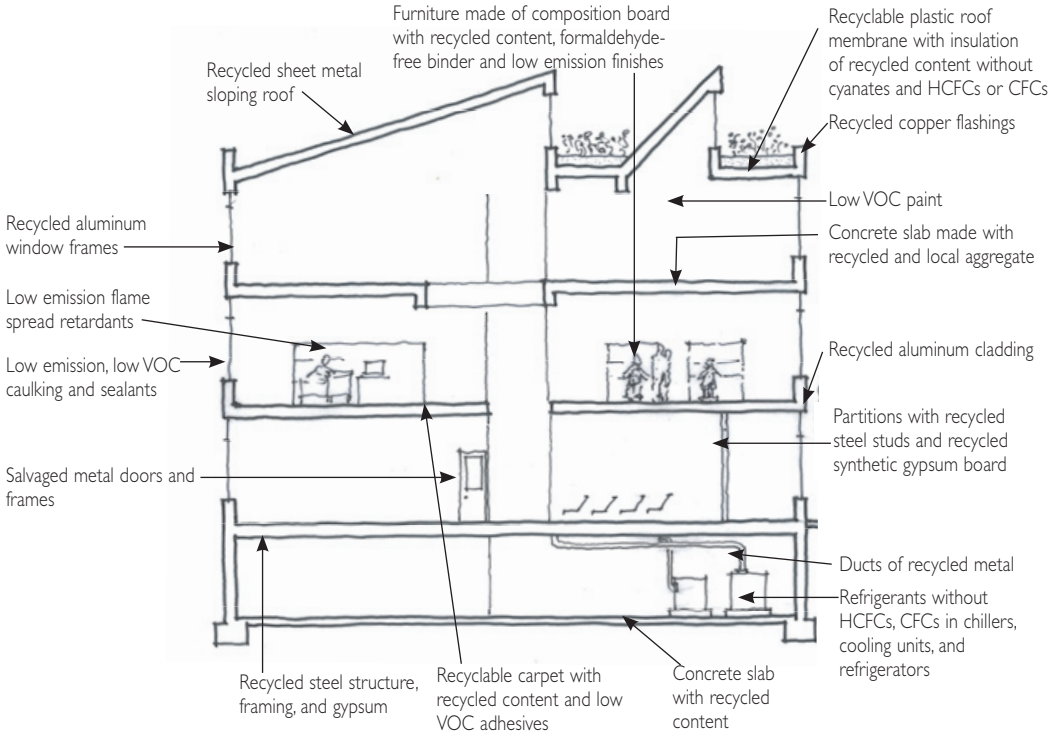

Fig. MR-1: A few Material and Product Selection alternatives.

Fig. MR-2: Local source of felled trees was utilized to create porch columns, Schlitz Audubon Nature Center, Bayside, Wisconsin.

ENVIRONMENTALLY PREFERABLE MATERIALS

Specify materials which have long life cycle assessments, are locally made, and/or contain recycled content for at least 25% of the value of total building materials. Give preference to materials with low toxicity and other environmental benefits such as reduction of urban heating. (*Value assessed as a formula of cost times multiplier of recycled content)*

Cost and Savings

Central Redimix can replace up to 30-35% of cement with fly ash and slag at no extra cost.

Durable, low-maintenance material choices (including wall, window, door, roof and other finishes) reduce facility operational costs and increase resale value.

CG Schmidt built their headquarters using a high percentage of recycled content, locally assembled and low embodied energy materials with +3% first cost premiums.

Benefits

Environmentally preferable materials are by definition healthier choices, providing long term personnel savings.

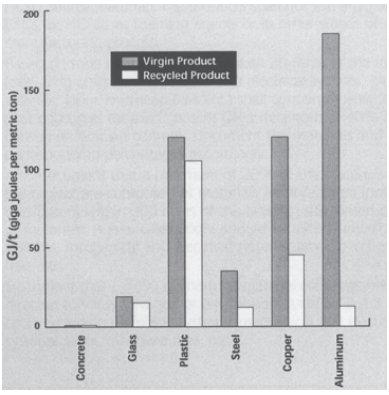

Fig. MR-3: Embodied Energy of Building Materials (Source: ACI Materials Journal, Sept-Oct, 1997, p 415)

BASIC LEVEL TECHNICAL STRATEGIES:

- Specify, for at least 25% of building materials. Materials and Products which contain in aggregate a minimum weighted average of 20% post-consumer recycled content, OR a minimum weighted average of 40% post-industrial recycled content.
- Use local/regional materials for 25% of building materials (region within 500 mile radius of site)
- Use durable, low-maintenance, low environmental-impact materials.
- Use benign (low or zero VOC) materials approved by third party testing agencies.
- Base choices on the testing or recommendations of agencies listed in the Sources and Standards list below.

ADVANCED TECHNICAL STRATEGIES:

In addition to the above:

- Specify an additional 25% (50% total) of building materials that contain in aggregate a minimum weighted average of 20% post-consumer recycled content, OR a minimum weighted average of 40% post-industrial recycled content.
- Specify a high-reflectance and high-emissivity roofing system (Energy Star®-compliant) over at least 75% of the roof surface, or a 'green' (vegetated) over at least 50% of the roof surface to reduce the heat island effect and urban heating.

SOURCES AND STANDARDS:

The following resources can assist consultants in developing specification criteria for environmentally preferable materials. For further information for local sources, contact the Wisconsin Green Building Alliance (http://www.wgba.org). For materials available for reuse, contact WasteCap Wisconsin (http://www.wastecapwi.com).

General Resources

- Air Force Green Facilities Guide, http://www.afcee.brooks.af.mil/green/facilitiesguide/erfguide.pdf.
- BEES (Building for Environmental and Economic Sustainability), National Institute for Standards and Technology (NIST), http://www.nist.gov/public_affairs/update/upd980427.htm. Software analyzes life cycle environmental and economic impacts for a limited group of building materials.
- Energy Star Program, U.S. EPA, http://www.energystar.gov
- Environmental Building News (EBN), http://ebuild.com. Leading periodical on environmentally preferable products.
- The Environmental Resource Guide, The American Institute of Architects (AIA), call (800)225-5945
- EPA Comprehensive Procurement Guidelines, http://www.epa.gov/cpg.
- The Green Building Resource Guide, http://www.greenguide.com.
- Green Seal, Inc. (Third-Party Certification Service), http://www.greenseal.org. Non-profit promotional site.
- Green Specifications Research, Final Report, available at http://tradecenter.ntis.gov/
- HOK Healthy and Sustainable Materials Database, http://www.HOK.com/sustainabledesign.
- Resources for Environmental Design Index (REDI), http://www.oikos.com/redi/index.html.
- National Park Service Sustainable Design and Construction Database, http://www.nps.gov/dsc/dscgncnstr/.
- Scientific Certification Systems, http://www.scs1.com/index.html. Independent certification program.
- Sustainable Building Sourcebook, http://www.greenbuilder.com/sourcebook. Concise and practical reviews.

Product Category Standards:

- Engineered Wood Products: ANSI A208 and HPVA, http://www.ansi.org
- Paints: Green Seal, Inc., http://www.greenseal.org
- Architectural Sealants: http://www.baaqmd.gov
- Construction Adhesives: http://www.aqmd.gov
- Carpets: http://www.carpet-rug.com

Construction Management

Goal: Remove or reduce sediment moving off-site while land is being redeveloped, and reduce and divert the amount of demolition and construction waste going to landfills.

The time of construction is the most extensive disturbing of a site, and also the time when a great deal of waste is generated. Time and effort must be devoted to nurturing and managing the construction process, verifying that sustainable concepts are actually implemented in the construction process and in the building, and that those systems then meet the anticipated level of performance.

Construction Site Erosion Control

Reduce the amount of soil erosion and sediment-laden stormwater runoff from leaving a construction site per the City of Wauwatosa's Construction Site Erosion Control Ordinance and Wisconsin Administrative Code NR 216.

Basic Level Technical Strategies:

- Preserve, to the extent possible, existing non-invasive vegetation and reduce the area of the site to be disturbed.
- Properly install and maintain erosion control measures per the City of Wauwatosa's Construction Site Erosion Control Ordinance, and Wisconsin Administrative Code NR 216. These BMP's may include the following basic ideas: keep the ground covered, provide perimeter protection, restrict sensitive areas, control surface water, stabilize traffic areas, retain sediments, control dust, maintain systems during construction, and provide final stabilization at completion.
- Clean adjacent streets and sidewalks at the end of each day of work.
- Prepare and submit a Site Erosion Control Plan and adhere to it throughout construction and the establishment of a permanent landscape cover.

Benefits

A study in the Menomonee River watershed in northwest Wisconsin found over half of the sediment load to the river was produced from the 7% of the watershed under construction. Controlling erosion can have great environmental benefits (WDNR, 1986).

Fig. CM-1: Reduced Site Disturbance.

Construction Waste Management

Divert a minimum 25% (by weight) of demolition, land clearing, and construction waste from landfills.

Costs and Savings
Reduces waste removal and dumpster fees during construction or renovation.

Basic Level Technical Strategies:

- Develop a Construction Waste Management Plan with a goal to recycle and/or salvage 25% (by weight) of construction, demolition, and land clearing debris.
- Use the resources of WasteCap Wisconsin to develop the construction waste management plan, provide dumpster signage on site, etc.
- Unless soil conditions require mitigation or stabilization, balance site excavation and grading materials on site.

Advanced Technical Strategies:

In addition to the above:

- Recycle and/or salvage an additional 25% (50% total, by weight) of construction, demolition, and land clearing debris as part of Construction Waste Management Plan.

Costs and Savings
Schlitz Audubon Nature Center in Bayside, Wisconsin recycled 75% of construction waste, resulting in a savings of $4,000 in dumpster fees.

Fig. CM-2 and CM-3: Construction Waste Diversion Program at Schlitz Audubon Nature Center, Bayside, Wisconsin. Segregated areas and dumpsters were clearly signed to allow for efficient disposal during construction.

MAINTENANCE OF GREEN SPACES

Goal: Support the long term health and function of the Economic Development Zone's shared green conservation land.

Specific areas of the site have been designated as conservation zones. Many of these are areas that act as shared naturalized stormwater detention areas and other areas function as shared green spaces for the inhabitants of the site to utilize as parkland. In order to stay viable and serve the purposes for which they are intended, a plan for the maintenance and stewardship of these green spaces must be agreed upon by the developers of the site.

MAINTENANCE OF GREEN SPACES

A master maintenance and stewardship plan for the common areas of the site must be developed and agreed upon.

BASIC LEVEL TECHNICAL STRATEGIES:

- Prepare Operations and Maintenance Manual / Plan per ASHRAE 4-1993.
- Create an assessment method and committee responsible for the on-going maintenance of conservation areas.
- Schedule maintenance operations regularly.
- Prepare a waste collection plan.

ADVANCED TECHNICAL STRATEGIES:

In addition to the above:

- Form an in-house "green team" to raise awareness of environmental concerns.

Fig. MGP-1: People are an essential part of a native prairie, Bluff Spring Fen, Elgin, Illinois.

Fig. MGP-2: Yearly burn programs are essential for prairie stewardship and ensure their long-term survival, Tellabs, Inc., Bolingbrook, Illinois. All burn programs will require a permit from the City of Wauwatosa Fire Department.